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# Usability Evaluation and Improvements of Mobile Travel Apps

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***Abstract***

*The popularization of smartphones allows people to instantly get the information that they want, through mobile apps, including financial services, movies and public transportation reservations, games and shopping. Furthermore, leisure activities through overseas travel are increasing due to the improvement of the living standards of people. These increases in overseas travel and the use of mobile apps lead to the increased use of mobile travel apps when booking tour packages. Although there are many studies on the usability assessment and user interface improvement for mobile apps, studies on the usability assessment for mobile travel apps are limited. We tested the usability for mobile travel apps to present some suggestions for improvements so that anyone can purchase travel packages easily and simply. We selected the top three mobile travel apps on Rankey.com that have different UIs. The heuristic method was used to evaluate usability. We present a better UI to allow users to use the app functions more easily by analyzing user interaction, ease of learning, readability, efficiency, and satisfaction for the entire use.*

***Keywords:*** *Usability, Mobile Apps, User Interface, Heuristic Evaluation*

## 1. Introduction

The spread of mobile devices makes it easy for people to obtain the information they need anytime, anywhere [1-3]. This can lead to the demand for mobile applications, which creates momentum that changes users's consumption patterns in their everyday lives. Comparing 2010 to 2016, the number of outbound travelers increased by a large margin, and travelers in their 40s and older preferred tour packages from travel agencies for various reasons [4]. The most important reason why travelers over 40 choose package tours is the language difficulties and the reduced burden on travel costs [4].

These increases in overseas travel and the use of mobile apps lead to the increased use of mobile travel apps when booking tour packages. In this paper, we want to evaluate the usability of the mobile travel apps and present the direction of improvement.

The mobile travel apps, which are currently the most frequently used ones, have been selected for usability

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assessment. The test of mobile travel apps mainly focused on searching, booking and purchasing package tour products. After selecting the apps, six experts were asked to evaluate the usability by applying a heuristic evaluation method. Based on the analysis, this paper draws improvements and suggests an improved user interface.

The structure of the paper is as follows. Chapter 2 explains the preceding research on the evaluation of mobile app usability as a literature review. The usability test method is designed in Chapter 3, and the results are analyzed in Chapter 4, and the improvement suggestions are drawn. Chapter 5 is the conclusion.

## 2. Literature Review

Related to this paper are studies on evaluating the usability of mobile apps. Some research analyzed that the usability assessment results for existing movie booking mobile apps did not fully reflect the user experience [5-6]. To evaluate the usability of movie booking mobile apps, they produced a scenario by understanding the service process of movie booking mobile apps and observing actual uses of the service. Using the Cognitive Walkthrough, the mobile app usability assessment was tested for the three largest travel agencies in South Korea. To improve and meet the user experience by analyzing the usability assessment results, three conditions were proposed: scrolling from side to side, panning page-to-page, and the retention of selected information [5-6].

In the study titled “Comparison Analysis of Visual Interface Design of Local Application Mobile Aviation Services - Focus on the Comparison between the Korean air and Asiana Airlines,” the visual elements of the UI (User Interface) were analyzed and the usability of the major functions of the aviation service was measured. A simple icon form that is convenient for users was presented, along with the need for an interface design that is easy for users to recognize and use. Eliminating unnecessary elements and highlighting the necessary elements, it suggested the need for an interface design that is simple without additional instructions and easy to be recognized and used by users [7].

In the "Local-based Public Transportation Mobile Application UI Design Study," an evaluation of mobile apps for express/intercity bus terminals was made. It found that switching from a form of mobile web to one that enabled users to fully utilize the capabilities of mobile devices would not only increase user convenience, but also create a more diverse background for services. With many smartphone apps utilizing spatial information, more use of spatial information was expected in the future, the utilization in creating public goals and business opportunities was predicted, and whether improvements were met to the overall UI flow and convenience was studies in the research [8].

The study on “e-Book interface usability assessment” conducted a usability assessment of the interface of e-book viewers, a type of application installed on smart devices. It emphasized the importance of configuring the flow of content, and presented improvements and direction indicators in production that readability can be expected with an additional function to express on e-books, and that a better reading form can be maintained with this new additional function [9].

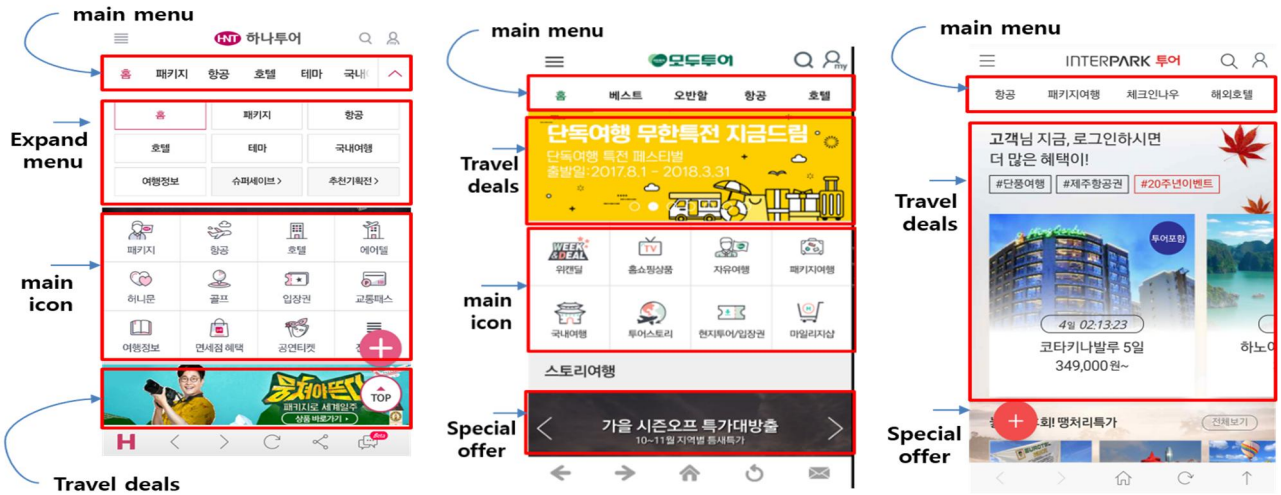
Travel product applications provide an opportunity for anyone to book travel packages easily, while at the same time being in charge of a part of cultural life. Studies were conducted for tour packages, which presented design directions, such as pricing, resource allocation, and purchasing preferences, or the analysis of negative factors for impulse buying. Nevertheless, the study of the usability assessment on packages themselves has been relatively neglected [10].

Therefore, this study will suggest potential improvements with a comparative analysis for the usability of the selected three apps while booking tour packages, which have different UIs and are the most used among users.

## 3. Designing how to test the usability of travel apps

### 3.1 Selection of apps for the test of the usability

The number of South Koreans traveling abroad has been increasing steadily to approximately 22 million, as of 2016 [4]. Among traveling abroad, the proportion of those taking package tours is on the increase. The top three mobile travel apps on Rankey.com that have different UIs were selected. Figure 1 shows the initial screen of the apps to be evaluated.




HanaTour ModeTour Interpark Tour

**Figure 1. First page of the apps for usability assessment**

HanaTour and ModeTour are well arranged with an at-a-glance configuration on the basic screen that makes it easy for anyone to access, while Interpark Tour works more on the configuration to the notification area than that of menu. HanaTour offers three basic menus and three icon areas to select package products, while ModeTour and Interpark Tour offer one icon area and one basic menu, respectively. The three agencies all provide default icon areas for direct searches, and ModeTour has a clarity of icons for direct searches, which is more apparent than that of the other three apps. The Find icon and the full menu icon for the default search are in the same location.

### 3.2 Usability evaluation method

Usability evaluation is the process of observing what patterns a user uses to create an app or a website and looking for conditions to build a better website[11-13]. In this paper, the heuristic method was used to evaluate usability. When it comes to the heuristic method, Jakob Nielsen said that even five evaluators could find approximately 80 percent of usability problems.

To evaluate usability, six experts from multimedia and UI fields were selected to conduct a heuristic assessment. Evaluators were given tasks to perform usability evaluations while doing their tasks. To improve

the fairness of the evaluation, evaluators were divided into three groups: group A, group B, and group C. The tasks were carried out by the groups in different order with three apps. Group A conducted the tasks in the order of HanaTour, ModeTour, and Interpark Tour; Group B in the order of ModeTour, Interpark Tour, and HanaTour; and Group C in the order of Interpark Tour, HanaTour, and ModeTour. This is to achieve more accurate results by performing tasks according to the different app with which each group started, provided that the level of familiarity with the apps they use first and the ones they use next makes it difficult to produce accurate results.

### 3.3 Tasks and evaluation items for usability evaluation

Two tasks were defined for usability evaluation and required evaluators to evaluate the time and error recovery, user interaction, ease of learning, readability of information, and satisfaction after performing the task. The first task is described in Table 1, and Table 2 is the item to be evaluated after completing the task in Table 1.

**Table 1. Task 1 for usability evaluation**

| **Searching package tours** |
|---|
| 1. Searching for package tours in May for a family of four (two adults and two children) with three nights and four days, including Osaka, Japan. |
| 2. In May, searching for the cheapest package tour on the same terms as No. 1. |

**Table 2. Evaluation item for the task 1**

| **Factor** | **Evaluation Item** |
|---|---|
| **Time and Errors** | How long does it take to access the app's initial screen? (until closing ads and pop-up windows)<br>How long does it take to search (conduct) No.1 Search task of Task 1?<br>How long does it take to search No.2 Search task of Task 1 under the same conditions as No. 1?<br>How many errors come up when performing tasks?<br>(including errors on searches and results) |

Table 3 shows Task2, and Table 4 shows elements and items to be evaluated after performing Task1 and 2.

**Table 3. Task 2 for usability evaluation**

| **Modifying package tours** |
|---|
| 1. Is it possible to change the default flight to the main airlines (Asiana or Korean Air)? |
| 2. Is it possible to select a different departure date (including month) from the searched package? |
| 3. Is it possible to change the number of travelers? |
| 4. Is it possible to choose the number of shopping schedules in an itinerary? |
| 5. Is it possible to choose the number of optional activities in the itinerary? |
| 6. Are the conditions for the advanced search varied? |
| 7. Return to the first (initial) screen after retrieving information |

**Table 4. Usability evaluation after completing Task 1 and 2**

| Factor | Evaluation Item |
|---|---|
| **User interaction** | It is easy to use the auto-complete function in a direct search. |
| | It is quick to display the information after searching a package. |
| | It is easy to move to the main screen. |
| | There are no errors and inconveniences with multiple searches. |
| **Ease of learning** | It is easy to find functions for package product searches. |
| | It is easy to search for the elements needed to search. |
| | The configuration of the menu is recognizable easily. |
| | It is easy to use the optional functions for package product searches. |
| | It is easy to carry out an advanced search with options. |
| | It is simple to use the button to select the number of travelers. |
| **Readability of information** | It needs to use the zoom button while searching. |
| | It shows accurate results of package tour searches |
| | The delivery of information by the distinction with text size and color is clear. |
| **Efficiency and satisfaction** | The user is satisfied with the search results after using the app. |
| | It supports going back to the previous screen when using the back button. |
| | The user is satisfied with the app on the whole. |
| | The user is satisfied with the content of searched information. |

Task 1 measured the time and errors required to perform tasks. In Task 2, the satisfaction for the usability evaluation was scored with five levels: very satisfied (5 points), satisfied (4 points), neutral (3 points), dissatisfied (2 points), and very dissatisfied (1 point).

## 4. Analyzing the result of the evaluation

### 4.1 Evaluation results

Figure 2 shows the evaluation results of the time and errors that it takes to perform Task 1. The time was measured for each evaluator, and measured up to 10/1 seconds using a timer.

The initial screen access time of the app was measured based on the initial screen for using the app after removing advertisements and unnecessary pop-ups that appeared after clicking the app. HanaTour took 8.7 seconds, ModeTours with 11.2 seconds and Interpark Tour with 9.3 seconds. This is also related to the number of ads and pop-ups that appear when an app is clicked. For the ModeTour app, notifications about ads or pop-ups stay longer than those of HanaTour and Interpark Tour. A time difference may exist as well, depending on the Internet condition at the moment of performing tasks.

The time to perform Task 1-1 means the amount of time to search for a four-member family (two adults and two kids) of tour packages for three nights and four days including Osaka, Japan, in May. It can be seen that HanaTour takes an average of 122.5 seconds (about 2 minutes and 3 seconds), ModeTour 103 seconds (about 1 minute and 43 seconds), and Interpark Tour 225.5 seconds (about 3 minutes and 46 seconds). While HanaTour and ModeTour offer similar UIs from the user's perspective, Interpark Tour appears to take more time to perform tasks because of providing different UIs from the other two apps. There were also a few opinions that Interpark Tour was similar to a web UI, so it was more accessible to users using Interpark Tour with PCs.

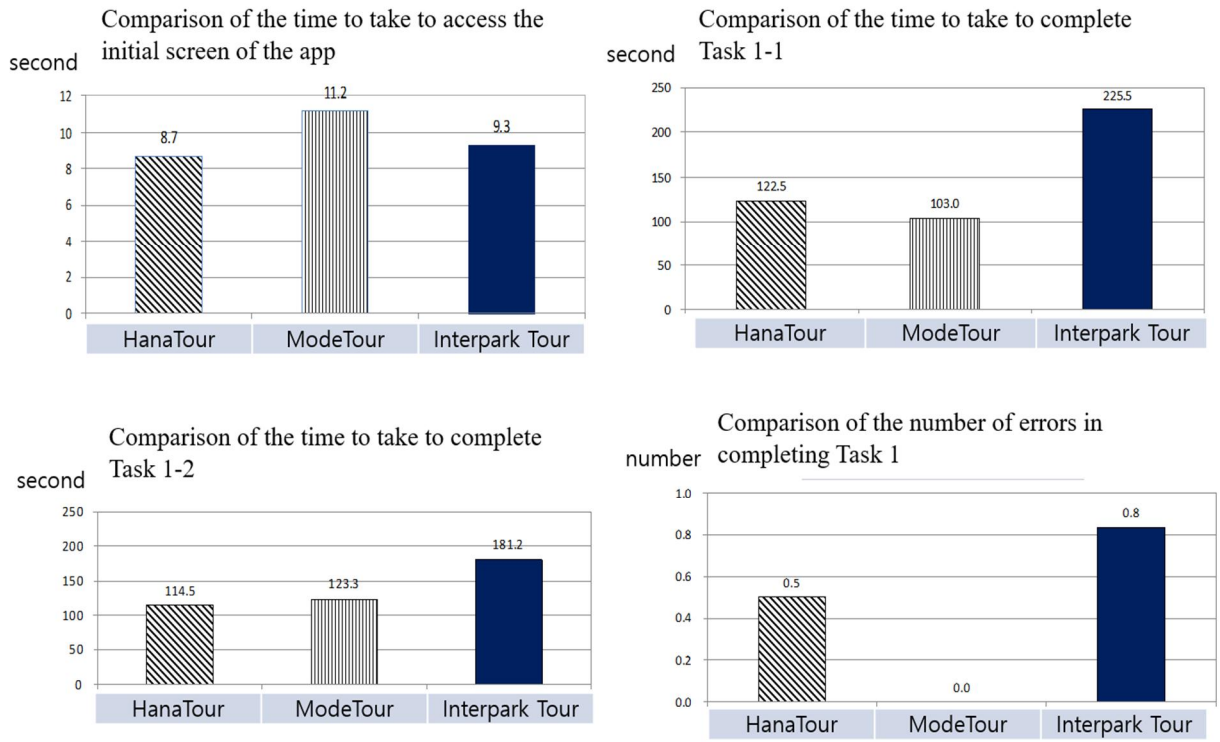



**Figure 2. Task evaluation results of time and errors to complete Task 1**

Analysis of the time to complete Task 1-2 indicates that HanaTour takes the average performance time of 114.5 seconds, 123.3 seconds for ModeTour, and 181.2 seconds for Interpark Tour. This depends on how each app performs its tasks by selecting a calendar for the month of May. ModeTour displays it on the screen by iconization. When selected, the lowest prices for the month are displayed at a glance by showing the lowest prices for each selected package on a monthly and daily basis.

In the case of HanaTour, contrary to ModeTour, if the month is selected and then the date is selected one by one, it will appear in the form of a daily list according to the composition of the tour packages for each day. In order to select the lowest price for the whole month, all days of the month must be selected first and then the package with the lowest price should be chosen. In the case of Interpark Tour, the month and the days are displayed on the entire screen, but the package list is not displayed on the screen without scrolling the screen. It prevents users from checking if the package has been correctly selected or the selection has been completed. On the other hand, it is advantageous for choosing quickly by scrolling to check information and displaying all arranged data from the selected date when the condition is input as the lowest price.

The number of errors that appeared when Task 1 was performed was compared. On average, HanaTour recorded 0.5 and Interpark Tour 0.8, while ModeTour showed no single error from all tasks in Task 1.

Figure 3 shows the average by each evaluation item for user interaction. While ModeTour showed even scores for all items, HanaTour showed relatively low satisfaction in item 4 “errors and multiple searches”, and Interpark Tour showed significantly lower satisfaction in item 2 “information after package search.”

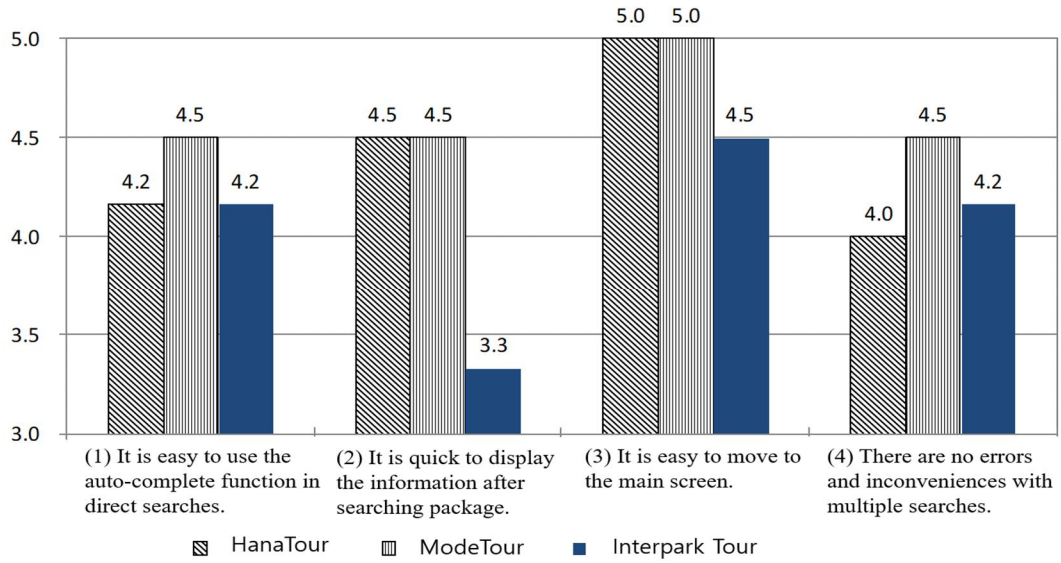



**Figure 3. Analysis result of evaluation factors of user interaction**

Figure 4 shows the averages of ease of learning by six items. When it comes to satisfaction level by question of the evaluation of the ease of learning, ModeTour scored higher in all six questions than the average for all evaluation items.

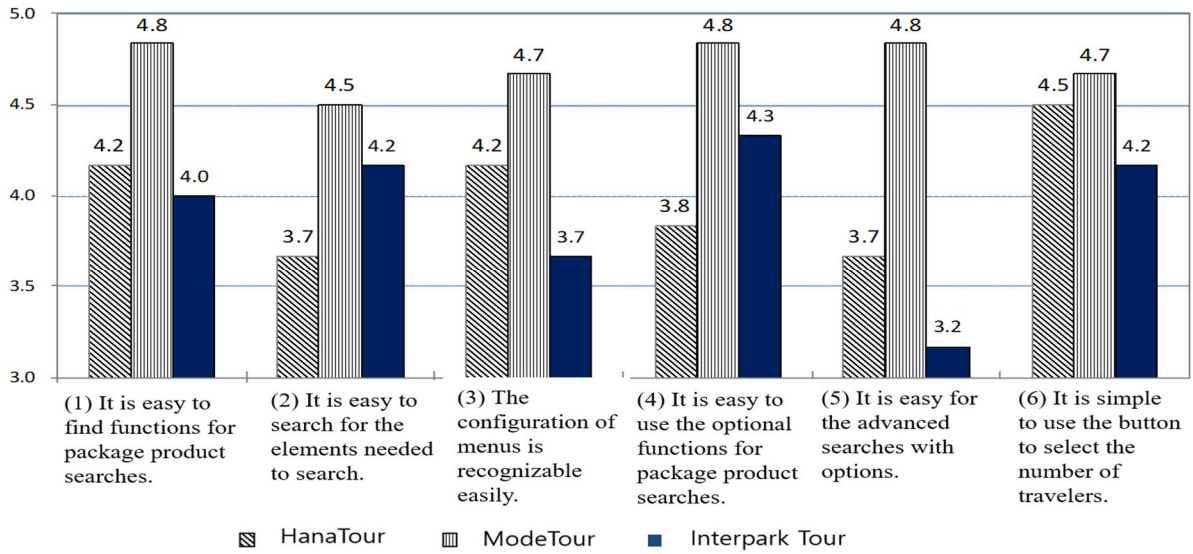



**Figure 4. Analysis by evaluation factors for the ease of learning**

ModeTour offers up to eight options, including reservation status, transportation, range of travel charges, departure time, number of shopping trips, hotel ratings, and local required expenses, within the re-screening catalog for advanced searches after selecting travel packages. HanaTour presents five conditions, including search period, travel period, departure day, departure city, and package price, within the advanced search catalog before selecting a tour package. After selecting the package, the advanced search can be made under five conditions: travelers, travel period, package price, national carrier, and travel guide. Interpark Tour

presents only other date searches after selecting packages, which showed low satisfaction with the advanced search.

Figure 5 shows the average of three evaluation items for the readability of information. All three apps were found to be well-readable without a zoom button. In terms of content that matches package search, ModeTour showed high satisfaction.

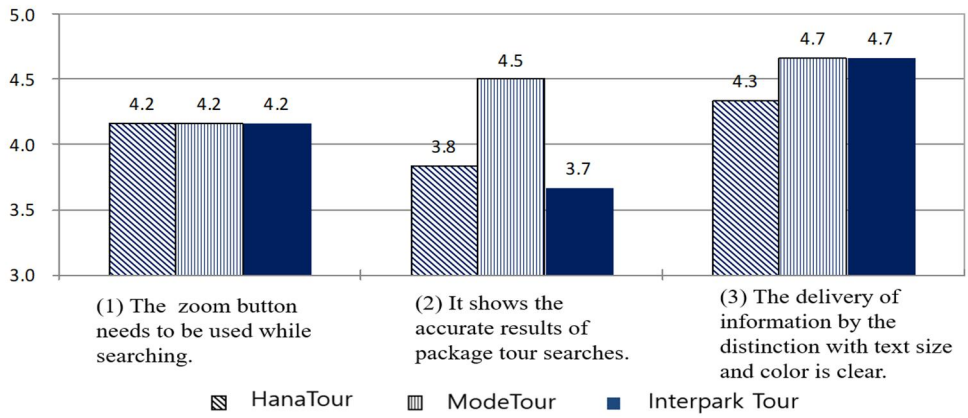



**Figure 5. Analysis by evaluation factors for the readability of information**

Figure 6 shows the average of four evaluation items for the efficiency and satisfaction. While ModeTour shows satisfaction evenly with more than 4.5 points in all evaluation items, HanaTour and Interpark Tour had lower scores in terms of satisfaction with their overall use.

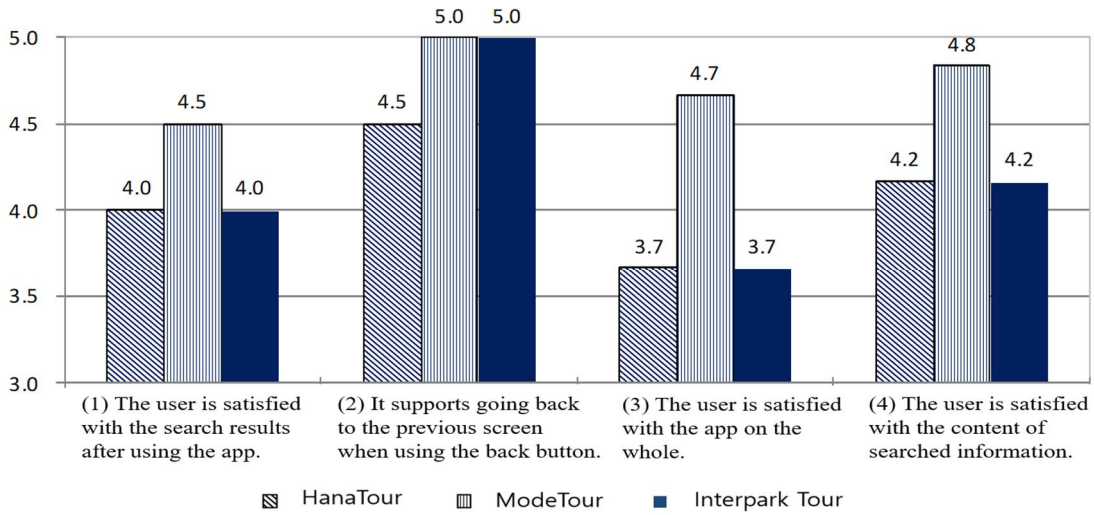



**Figure 6. Analysis result of evaluation factor of efficiency and satisfaction**

### 4.2 Suggestions for improvements

The three apps that were tested for usability evaluation in this study commonly contain a lot of information on the screen. More improved UI was presented by analyzing the usability evaluation.

. It is suggested that the screen should be constructed distinguishing between package tours, flight tickets, and hotels to allow users to find the necessary information accurately and with a simple configuration of the

main screen.

. The content of selected information should be clearly discerned by domestic, overseas, and selection criteria, and the detailed conditions of domestic and overseas should be configured in common to allow users to access the information quickly.

. It is proposed that users should be able to filter conditions for searching and choose package tours with advanced searches, details of selected packages, and immediate choices.

. It might be good to display necessary advanced searches without scrolling because multiple searches may be needed for too many or very few searches in the advanced search.

. If users are satisfied with the package after searching for information about the package they want, it is suggested that they can go to the screen to make a payment as soon as they select the package tour.

. It is suggested that users can input the total number of travelers for the selected package and choose the payment as a member or a guest.

## 5. Conclusion

The popularization of smartphones and the increase in leisure activities have given users the opportunity to easily get the information they want without being constrained by time or space. The demand for mobile applications has promoted changes in the consumption patterns of everyday life, leading to consumption patterns to improve the quality of life and enjoy leisure. This study explored ways to improve the convenience of using the services and information users need by testing the usability of reservation applications of package tours among travel packages, and to present guidelines for new travel websites and suggestions for improvement.

How fast the apps respond was also tested by measuring the time to complete tasks. It presented a better UI to allow users to use and understand the functions such as app-specific function more easily by analyzing user interaction, ease of learning, readability, efficiency, and satisfaction for the entire use.

The results of the heuristic evaluation by experts find that the ModeTour app showed the highest satisfaction among the three apps. In terms of user interaction, ease of learning, readability of information, efficiency, and satisfaction, all of these factors were remarkably higher in ModeTour. It means that users have a high level of satisfaction in terms of configuring the screen or displaying information because they access the app easily and find the information they want.

HanaTour, which scored relatively low in satisfaction, did not sufficiently allow users to make decisions when they saw the information because it made them choose repeatedly for dates, despite a lot of information it provided. Although it failed to present a simple screen configuration, Interpark Tour presented all information at a glance on a daily basis after the search.

The findings of this study indicate that there were currently differences between various travel apps in menus and what they wanted to deliver, and different UI designs could be recognized and used by users as a new design. The study is expected to increase users' ease of use and provide guidelines for the redevelopment of the apps.

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